An integrated unit focusing on the management decisions regarding one of Arizona's major predators

Mountain Lions in Arizona

Lesson 1: The Lion as Predator – Agile as a Cat

LESSON OVERVIEW

In this lesson, students will learn about some key adaptations that make the mountain lion an effective predator. They will do this by comparing the ability of mountain lions to perform certain actions, such as jumping and listening, with the ability of humans to perform the same actions.

SUGGESTED GRADE LEVELS

- 6 – 12

ENDURING UNDERSTANDINGS

- All organisms have adaptations that allow them to survive in particular environments.

OBJECTIVE

Students will:

- Work in small groups to analyze data.
- Perform a variety of simple actions.
- Compare abilities of mountain lions and humans.

ARIZONA DEPARTMENT OF EDUCATION STANDARDS

Grade	Science	Social Studies
6	S1-C2-04	None
7	S1-C2-04; S1-C3-05; S4-C3-02	None
8	S1-C2-04; S1-C3-05; S2-C2-04; S4-C4-01	None
High School	S1-C3-06; S1-C4-04; S4-C4-02	None

Note: The full text of these standards can be found in Appendix A.

TIME FRAME

- 1 – 2 days (45 minutes each day)

MATERIALS

- *Are You as Agile as a Cat?* worksheet (1 per student)
- Meter sticks and tape (1 per group)
- Butcher paper (1 sheet per group)
- Protractors (1 per group)
- Markers (1 set per group)

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- Calculators (1 per group)

TEACHER PREPARATION

- Make a copy of the *Are You as Agile as a Cat?* worksheet for each student.
- Gather materials.

SUGGESTED PROCEDURES

1. Ask students: In what ways are mountain lions and humans similar? They can answer in the form of a journal entry or a class discussion. Discuss some student answers.
2. Explain to students that today they will be making comparisons between their abilities and those of mountain lions.
3. Hand out the *Are You as Agile as a Cat?* worksheet.
4. Read the first two paragraphs as a class or individually.
5. Briefly explain the assignment and each of the activities that students will be completing. Review how to use a protractor to be sure all students understand.
6. Divide the students into groups of three or four.
7. Allow the students to work. Check on groups periodically to ensure that all students are participating. Students may need two days to complete all of the activities.
8. After all groups have finished the activities, ask for volunteers to share their concluding paragraphs.
9. Collect the *Are You as Agile as a Cat?* worksheets.

ASSESSMENT

- *Are You as Agile as a Cat?* worksheet
- Class discussion

EXTENSIONS

- Students can construct a Venn diagram to compare mountain lions with humans.
- Students can study domestic cats, either through observation of their own pets or through the Internet, to identify ways in which they are similar to wild cats, such as the mountain lion.
- Encourage students to participate in the *Hot Topics Campfire Chat* with their parents at home.

Appendix A: Arizona Department of Education Standards – Full Text

Science Standards

Grade	Strand	Concept	Performance Objective
6	1	2 – Scientific Testing	4 – Perform measurements using appropriate scientific tools
7	1	2 – Scientific Testing	4 – Perform measurements using appropriate scientific tools
		3 – Analysis and Conclusions	5 – Formulate a conclusion based on data analysis
	4	3 – Populations of Organisms in an Ecosystem	2 – Explain how organisms obtain and use resources to develop and thrive in predator/prey relationships
8	1	2 – Scientific Testing	4 – Perform measurements using appropriate scientific tools
		3 – Analysis and Conclusions	5 – Explain how evidence supports the validity and reliability of a conclusion
	2	2 – Nature of Scientific Knowledge	4 – Explain why scientific claims may be questionable if based on very small samples of data
	4	4 – Diversity, Adaptation and Behavior	1 – Explain how an organism's behavior allows it to survive in an environment
High School	1	3 – Analysis, Conclusions, and Refinement	6 – Use descriptive statistics to analyze data, including mean
		4 – Communication	4 – Support conclusions with logical scientific arguments
	4	4 – Biological Evolution	2 – Explain how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment

Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Are You as Agile as a Cat?* worksheet – Describes lab procedures, provides data tables and sound maps for the students to fill out, poses questions, and provides space for answers. (3 pages)

Are You as Agile as a Cat?

All animals have evolved adaptations that allow them to survive in their environment. The mountain lion is no exception. Today you will look at the adaptations that make the mountain lion a good predator, capable of hunting its food, and compare these adaptations with those of humans.

You will be divided into small groups. Everyone in your group is expected to participate in each activity. This will increase your "sample size," or the amount of data you collect. Why is it important for scientists to have a large sample size? _____

_____

JUMPING

Mountain lions are very agile creatures. Part of their agility is related to their tremendous jumping ability. To compare your agility with that of a mountain lion, you are going to test how well you can jump.

Procedures

1. Move to a clear space in the classroom or outside.
2. Use chalk or tape to mark the starting point.
3. Without getting a running start, jump forward from this mark as far as you can.
4. Have a partner mark where you landed.
5. Measure the distance from the starting point to your landing point and write this under "Jump Distance" in Data Table 1.
6. Stand next to a wall.
7. Without getting a running start, jump as high as you can.
8. Have a partner mark the height on the wall.
9. Measure the distance from the floor to this mark and write this under "Jump Height" in Data Table 1.
10. Repeat steps 3 through 9 for each person in your group.
11. Calculate the average jump distance and height for your group.

Data Table 1: Jumping Ability of Group

Name of Student	Jump Distance	Jump Height
Average		

Questions

1. A mountain lion has been recorded as jumping a distance of 45 feet forward. How does this compare with your group's average? _____
2. A mountain lion has been recorded as jumping to a height of 15 feet. How does this compare with your group's average? _____
3. Why is this tremendous jumping ability important to a mountain lion? _____

_____

VISION

For predators such as mountain lions, vision is an extremely important sense. The better an animal can see, the more likely it is to find prey that does not want to be seen. One important visual characteristic is the "field of vision," which is defined as the amount of space, in all directions, that an animal can see. This includes the peripheral or outer part of the field of vision.

You can calculate field of vision by measuring how far to the sides an animal can see when looking straight ahead. To compare your vision with that of a mountain lion, you are going to measure your field of vision.

Procedures

1. Draw a circle on a piece of butcher paper that is large enough for you to stand inside (approximately three feet in diameter). Mark the circle's center.
2. Draw a mark on the circle and label it 0°.
3. Use a protractor to mark off every five degrees on the circle.
4. Stand on the center of the circle facing the 0° mark.
5. Focus on an object straight in front of you, and do not move your eyes.
6. Have a partner stand in front of you and move slowly clockwise around the circle.
7. Tell your partner to stop when you can no longer see him or her.
8. Place a mark where your partner stopped.
9. Repeat steps 4 through 8 but have the partner move counterclockwise.
10. Determine your total field of vision by counting the number of degrees between the two marks.
11. Write this number in Data Table 2.
12. Repeat steps 4 through 10 for all members of your group.
13. Calculate the average field of vision for your group.

Data Table 2: Field of Vision for Group

Name of Student	Field of Vision
Average	

Questions

1. How many degrees does a circle have? _____
2. A mountain lion has an average field of vision of 287°. How does this compare to your group's average? _____
3. Why would a large field of vision be beneficial to a predator? _____
   _____
4. Many prey species have their eyes on the sides of their heads. How would this affect their field of vision? _____

HEARING

Another important sense for predators is hearing. The cone-shaped ear of a mountain lion can be turned in many directions to collect sound and channel it into the eardrum.

Famous naturalist Joseph Cornell developed the concept of a sound map. This is a map on which you put together all of the sounds, in all directions, that you hear in a certain location. You will be making two sound maps, one with your regular hearing and one with modified hearing.

Procedures

1. Find a quiet space outside.
2. Sit down and face in one direction. You will face in this direction the entire time.
3. Spend five minutes completing a sound map in Figure 1 using your regular hearing. The "x" represents where you are sitting. Every time you hear a noise, draw a symbol that represents that sound at the approximate location where you hear it.
4. Spend five minutes completing a sound map in Figure 2 using modified hearing. Cup your ears with your hands so that they are focused in a particular direction. Periodically change the direction, but do not forget to mark any sounds you hear.
5. Compare your two sound maps with those produced by your partners.

Figure 1: Normal Sound Map

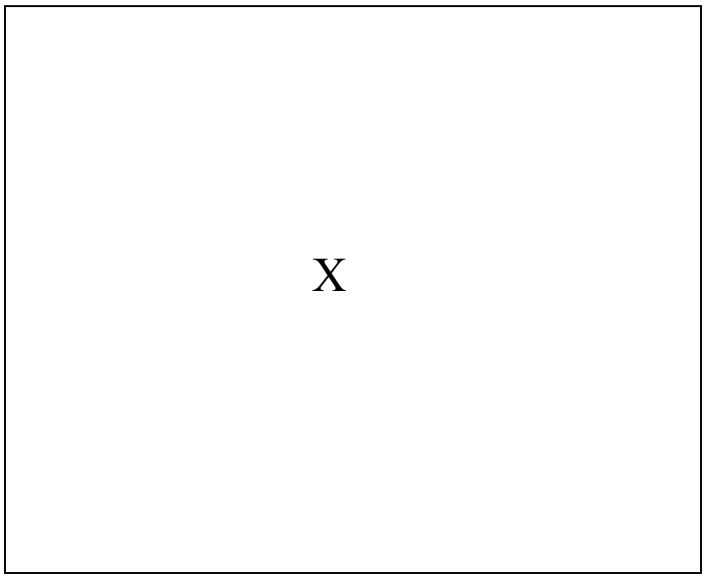
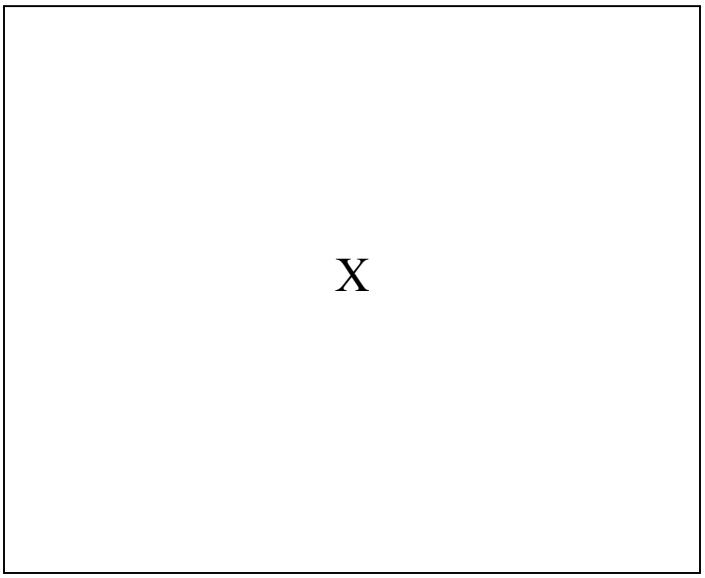


Figure 2: Modified Sound Map



Questions

1. What differences do you notice between the sound maps? _____
2. Which one do you think is most accurate? Why? _____
3. Why is the ability to focus in on sounds important to the mountain lion? _____

CONCLUSION

In a brief paragraph, compare the abilities of humans with those of mountain lions and explain why all of these adaptations make the mountain lion an efficient predator. You may use the back of this page for your paragraph.